able, however, that these processes will be further simplified before they will meet with general introduction. I am informed that several devices are being considered which will enable the effect to be produced by means of a single lantern. Various principles involved in the forms of stereoscope above discussed make it evident that such a device is by no means impracticable.

This eclectic summary of the progress of invention in the field of stereoscopic vision would seem to indicate that the interest in this topic is undiminished and that the field is still open for improvements and modifications which shall be useful in exhibiting the principles which underlie the workings of this truly psychological instrument.

Joseph Jastrow.

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*CLASSIFICATION OF IGNEOUS ROCKS.**

Professor Merrill remarked at the last meeting of the Geological Society that rock species do not exist in the definite sense in which this term is used in the organic world. Probably no petrographer will deny this conclusion.

Admitting, then, that rocks are mineral mixtures which may vary indefinitely, it is clear that the naming of these mixtures may be carried to excess. Let us, for example, take the feldspathic lavas. These may be divided into three great groups, the alkali-feldspar lavas or trachytes, the oligoclase-andesine lavas or andesites, and the labradorite-anorthite lavas or basalts. These three groups may be written graphically as follows:

The demands of modern petrography, perhaps, require the recognition of intermediate groups which may be designated by compound names. Thus a rock intermediate between syenite and diorite may be called a syenite-diorite. Such would be the rocks called mozonite by Brögger. Between the three great groups of feldspathic lavas above outlined there may be instituted three intermediate groups, as represented in the above diagram. One group intermediate between trachytes and andesites may be called the trachyte-andesite group; that intermediate between the andesites and basalts the andesite-basalt group, and that intermediate between trachytes and basalts the trachyte-basalt group, or, as Washington has suggested, trachydolerite, adopting a term in use in Italy. The recognition of such intermediate groups seems to me quite desirable, but if the subdivisions are carried still further the results are, perhaps, of questionable value. To see how complicated the classification may easily become, let us take the single intermediate group of trachyte-basalts. There are in Italy, in the Yellowstone Park, near Buda-Pesth and in California rocks which occupy this intermediate position. These lavas have been studied by skilled petrographers, and their excellent descriptions, with the accompanying chemical analyses, leave no doubt as to their exact nature.

The following names have been proposed for different varieties:

Trachyte-basalt group:

Yellowstone Park (Iddings)	Absarokite, Shoshonite, Banakite
Italy (Washington)	Trachydolerite, Toscanite, Vulsinite, Ciminite
Buda-Pesth (Koch)	Labradorite-trachyte
California (Ransome)	Trachandesite (Latite).

Dr. Washington, in one of his admirable petrographic papers,* notes the close resemblance of his Italian lavas with those of the Yellowstone Park, but nevertheless

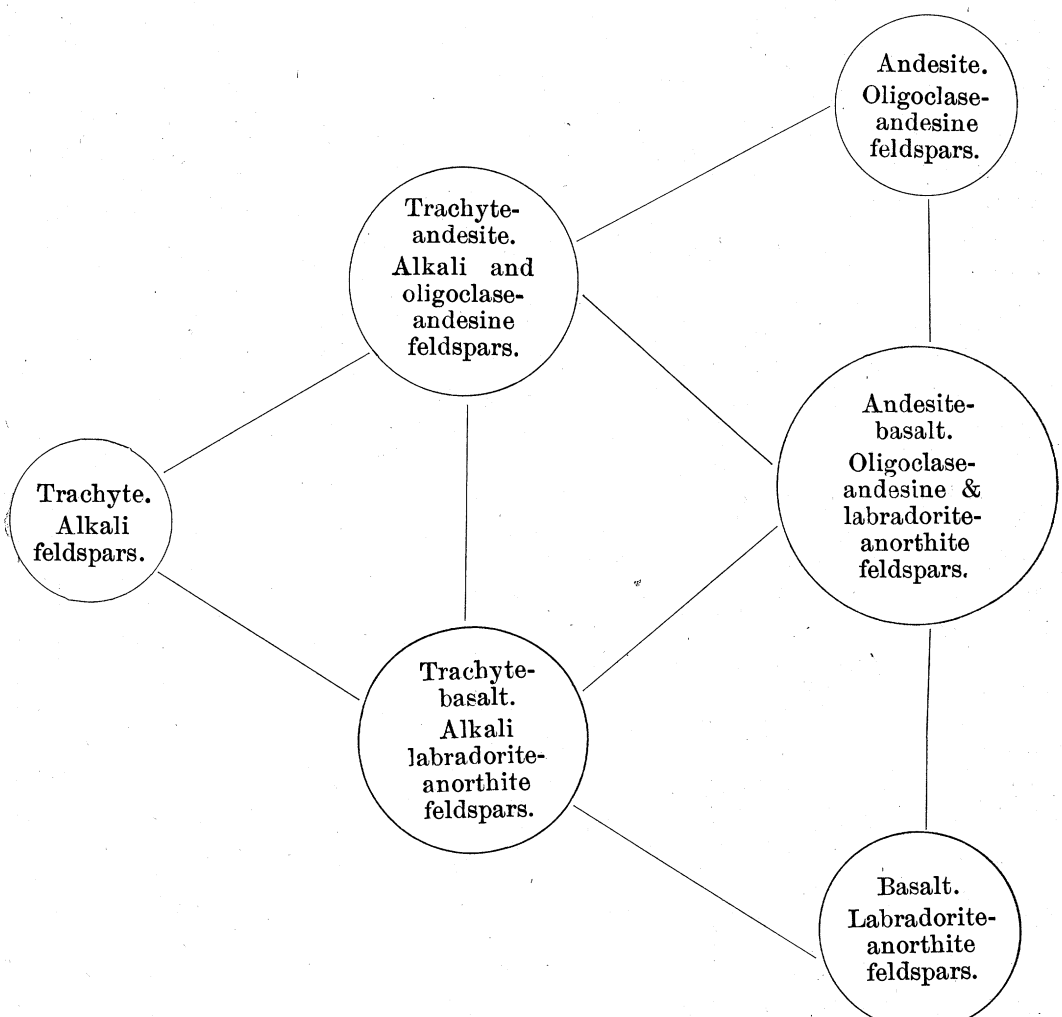
* Read before the Geological Society of Washington on February 9, 1898.

* *Journal of Geology*, Vol. V., page 363, 1897. See also table on page 366.

does not consider it advisable to apply the same names to the rocks of the two localities on account of minute differences and overlaps in chemical and mineral composition.

as no doubt this hypothetical third set of lavas would likewise overlap the flows in Yellowstone Park and in Italy.

Two of the names used in the above table, namely, trachydolerite and labradorite-



It is safe to assert that if a petrographer were given some specimens of similar intermediate lavas from an entirely new field to name he would find difficulty in choosing between the names adopted for the Yellowstone Park lavas and the names adopted for the Italian lavas, and the tendency would be to adopt still a third set of names,

trachyte, give at once to the reader a definite idea of the composition of the rocks. The term trachandesite* used by Dr. Ran-

*Since writing this Dr. Ransome has changed his name to a more specific name, *latite*. But as he regards his rocks as intermediate between trachyte and andesite the statements here made regarding them still apply.

some would be at variance with the set of intermediate families proposed in the above diagram. However, I understand Dr. Ransome to regard the feldspathic lavas as being more properly represented in a linear series, that is to say, the andesites would be regarded as a group intermediate between trachytes and basalts, and, following this system, it would be impracticable to institute any such group as the trachyte-basalts. The only possible intermediate group between the trachytes and plagioclase lavas would be trachyte-andesites. Dr. Ransome, in a forthcoming bulletin of the U. S. Geological Survey* on the trachandesites (latites), clearly states their relation to the Italian and Yellowstone Park lavas, and the position of these California rocks is at once evident to the reader. However, if we call all lavas composed of labradorite-anorthite feldspars, basalts, the recognition of a group intermediate between the trachytes and basalts seems inevitable.

While greater definiteness is unquestionably desirable in the naming of rocks, it seems but fair to the general geologist, and even to many who have given some time to the study of igneous rocks, that general terms should be used in all such descriptions, even if in subordinate paragraphs the rocks are given more definite names. This enables the reader at once to place approximately the rock.

It is possible that many of the current names for rocks could be improved by substituting a name derived from the most prominent mineral which enters into their composition. Thus a syenite might be called an orthosite, from the French term orthose or orthoclase. An augite-syenite would then be called an augite-orthosite. Even a granite might be called a quartz-orthosite, if in the use of compound terms we recognize only those minerals which are essential constituents and never use the names of accessory minerals in this way. There appears to be the greatest latitude in this matter. Some rocks are called hornblende-andesites in which only occasional hornblende needles are to be noted, and the same statement may be made with variation as to the mineral with a great many names. It appears to the writer that a hornblende-andesite should be a lava composed, if sufficiently crystalline, chiefly of oligoclase and andesine feldspars, with relatively abundant hornblende. This matter of keeping in mind the relative proportions of minerals in naming rocks, if carried out throughout the entire series of rocks, both with granolites and effusive rocks, would result in a name conveying at once a tolerably accurate idea of the composition of the rock.

The term basalt indicates nothing whatsoever to the reader as to what the rock is made up of. If we use the French term labradorite we have at once a definite idea as to what the mineral composition of the rock is. The term labradorite is used by the French for basalts which contain no olivine. The term olivine-labradorite could be used for olivine-basalt.

This method of deriving the name of the rock from its mineral components is thus not at all new. The andesites usually contain the feldspar andesine. The group of peridotites derives its name from the word peridot or olivine. A mica-peridotite is plainly a mica-olivine rock. An enstatite-peridotite rock is plainly an enstatite-olivine rock. There are now two terms used for the latter. One is Harzburgite* and the other Saxonite, and there has been much discussion over which name should take precedence. If we drop both terms we relieve the memory and make it plain to every one what the composition of the rock is.

* An abstract of this bulletin will soon appear in the *Am. Jour. Sci.*

* Rosenbusch, *Mikroskopische Physiographie der Massigen Gesteine*, 1896, p. 355.

It is, of course, evident that such mineralogical names cannot be applied to rocks of complex composition.

It seems clear that the naming of rocks may be carried to excess, and that the science of petrography may readily be buried under its own nomenclature.

H. W. TURNER.

U. S. GEOLOGICAL SURVEY.

THE DIVERSE FLORAS OF THE ROCKY MOUNTAIN REGION.

FEW persons living in the Eastern States are aware of the greatly diversified country which is included under the general title of the Rocky Mountain region. I have often been requested by correspondents to procure species which, being recorded from the 'Rocky Mountains,' were presumed to exist just outside my door, but which, as a matter of fact, were not obtainable within a hundred miles.

The striking diversity which exists, according to altitude, latitude and longitude, is worthy of attention from several points of view. To the horticulturist or botanist it suggests great possibilities of finding even conspicuous new species as new localities are explored. To the horticulturist it also strongly suggests possibilities in the way of fruit-raising, since those localities which have different wild plants are likely to be suitable for different and peculiar varieties of fruits. Valleys now uncultivated may in the future become famous for their special varieties of wine-grapes, of apples, peaches or vegetables. What has been done in Europe may be repeated here in time. Then again, to the geologist the facts are extremely significant. If the present flora of our region could be preserved in the rocks we should have a series of beds absolutely contemporaneous, yet exhibiting almost totally different sets of fossils, not merely as to species, but as to genera. The animal remains would be almost equally diverse; the insects even more so than the plants.

On August 30, 1889, I noted the more conspicuous plants observed in a short walk by Willow Creek, Custer County, Colorado, at about 8,200 feet altitude. The list is given here, and in a parallel column the nearest approximation to it obtainable in the immediate vicinity of my present home, Mesilla, New Mexico, 3,800 feet above sea level.

WILLOW CREEK, COLORADO.	MESILLA, NEW MEXICO.
Aconitum Columbianum.	Clematis ligusticifolia.
Delphinium scopulorum.	Ranunculus Cymbalaria.
Actæa spicata.	
Berberis repens.	(No Berberideæ.)
Erysimum asperum, var.	Sisymbrium, spp.
Viola Canadensis.	(No Viola.)
Silene Scouleri.	(No representative.)
Sidalcea candida.	Sphæralcea angustifolia.
Geranium Richardsoni.	(No representative.)
Lupinus argenteus, var.	Sophora sericea.
Thermopsis montana.	Dalea scoparia (with a forma nov. subrosea, flowers magenta).
Oxytropis Lamberti.	Astragalus Wootoni.
Fragaria vesca.	Prunus sp. (escaped from cultivation).
Potentilla fruticosa.	
Rosa blanda, var.	
Parnassia fimbriata.	(No representative.)
Ribes oxyacanthoides.	
Epilobium angustifolium.	Œnothera Hookeri and Œ. pallida.
Osmorrhiza nuda.	(Nothing near.)
Heracleum lanatum.	
Lonicera involucrata.	(Nothing near.)
Galium boreale.	(Nothing near.)
Aster lævis.	Aster tanacetifolius.
Aster Fremonti.	Aster canescens.
Erigeron glabellus mollis.	Erigeron divergens.
Gymnolomia multiflora.	Verbesina encelioides.
Achillea millefolium.	Lepachys Tagetes.
Rudbeckia laciniata.	Helianthus annuus.
Cnicus Parryi.	Cnicus ochrocentrus, var.
Troximon glaucum.	Pyrrhopappus, sp.
Campanula rotundifolia.	(Nothing near.)
Arctostaphylos uva-ursi.	(No Ericaceæ.)
Pyrola rotundifolia, var.	
Apocynum androsæmifolium.	Apocynum cannabinum (fide E. O. Wooton).
Gilia aggregata, var.	Gilia, sp.
Echinospermum floribundum.	Krynitzkia, sp.
Mimulus luteus.	Maurandia Wislizeni.
Castilleia integra, var.	
Orthocarpus luteus.	
Pedicularis procera.	
Polygynum aviculare.	Polygonum, spp.
Polygonum tenue.	
Polygonum convolvulus.	
Chenopodium album.	Chenopodium leptophyllum.
Comandra pallida.	Comandra pallida.
Quercus Gambelii.	(No Quercus.)
Populus tremuloides.	Populus Fremonti.
Iris Missouriensis.	(Nothing near.)
Smilacina stellata.	Yucca, spp.